MITIGATION OF RISKS IN USING PARALLEL PROJECT SCHEDULES

June 27 - 30, 2010
at the Atlanta Marriott Marquis

ATLANTA
Georgia

TCM - Cost Engineering on My Mind

AACE® International's 54th Annual Meeting

Atlanta, Georgia

Patrick M. Kelly, PSP

- **Degree:**
  - **B.S. Ocean Engineering (1996)**
- **University:**
  - **US Naval Academy**
- **Years of Experience:**
  - **11 (incl. Civil Engineer Corps)**
- **Professional Field:**
  - **Contracting, Project Manager, Project Controls Manager (Scheduling, Claims & Disputes Resolution). Managed aviation, industrial, commercial, infrastructure and critical structures assignments, and other projects nationwide, providing construction and contract management, schedule analysis, impact analysis, cost evaluation, entitlement analysis, and other claims and dispute resolution services.**
- **Something you do not know about me:**

Chris Carson, PSP, PMP, CCM

- **Corporate Director of Project Controls, Alpha Corporation**
  - **Responsible for standards, processes, and procedures for a team of schedulers, analysts, and project managers in multiple office locations**
  - **Provided seminars for hundreds of scheduling professionals in CPM scheduling methodologies, and manages the in-house training program at Alpha**
- **Certifications: PSP, CCM (Certified Construction Manager - CMAA)**
- **University: University of Virginia, Mechanical Engineering, 1972**
- **Professional Field: 37 years of experience in Construction Management, CM Services especially Scheduling, Estimating, Claims**
- **Active in PMI College of Scheduling**
  - **Managing Director for SEI (Scheduling Excellence Initiative) writing Best Practices and Guidelines for Scheduling and Schedule Impact Analysis**
- **Active in CMAA (Construction Management Association of America**
  - **Served on 9 person committee revising the Time Management Chapter of the CMAA's CM Standards of Practice**
- **Something you do not know about me:**
  - **I am a proud grandfather of two girls and a boy**
  - **I was given an award for "Significant Contributions to the Scheduling Industry" at the 2009 CoS national conference**

Overview

Overview

- **Dual schedule use rarely occurs, but there are occasions where a general or prime contractor may desire or need to run a separate schedule.**
- **This usually is the case when the contractor feels that there are significant risks to completion, such as risks associated with subcontractor performance, but the contractor does not wish or may not have the ability to run any type of formal risk analysis for uncertain durations.**

Overview

- **This presentation discusses the use of dual parallel project schedules, examines the risks and provides recommendations when dual schedules are used.**
  - **Many general contractors (GC) create these "production" schedules, separate from the "contract" schedules, which support the contractual relationship between the GC and the subcontractors, showing aggressive production rates in efforts to reduce late completion risks.**
  - **The paper identifies the problems created by the existence of the "production" schedules including contractual difficulties for all parties, increased managerial duties for the GC, constructive acceleration risks, and confusion in forensic analysis.**
  - **We recommend steps to handle this through risk analysis, in creating the schedules through a risk management process, including the use of global changes and only editing logic when it is "preferential" or resource-driven.**

Overview

- **Recommendations maximize the utility when it is necessary to use parallel schedules while minimizing problems created by their existence.**
- **This is not a discussion of "early completion" schedules.**

Note that it is preferable to only have one project schedule that is used for both management and analysis of delays.

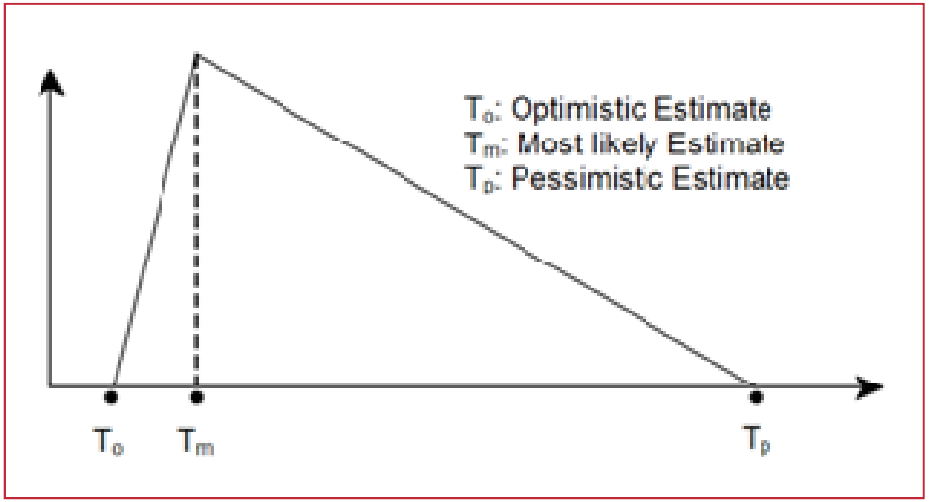
In the rare cases when it is necessary, or when the contractor insists on the use of dual schedules, there are some guidelines that should be followed.

These guidelines primarily revolve around the use of informal risk adjustment to provide some level of protection for a contractor while allowing him to pursue an aggressive schedule that is not highly likely to be achieved.

Definitions

Definitions

- **The Contract Schedule represents the minimum, or most likely, means and methods necessary to complete the project within the contractual time frame.**
  - **It represents the commitments made in the prime contract between the Owner and the Prime Contractor.**
  - **For calculation of activity durations, in terms of a three-point estimate method for determining activity duration, the Contract Schedule would use the "most likely" duration estimate, as shown in the figure below:**



Definitions

- **In terms of the logic assignment, the Contract Schedule would use all the hard logic constraints, but would also use a maximum amount of preferential logic constraints, particularly those which represent resource logic.**
- **From RP 24R-03 "Developing Activity Logic":**
  - ***"Activities can be linked with hard logic (i.e., sequence of each activity is predetermined, such as footing A before footing B), or soft logic wherein related activities may be combined and accomplished in a different order as determined at the time of execution. There are also physical hard logic relationships where soft logic does not normally apply, such as footing formwork must be in place before concrete can be placed."***

Definitions

- **The Contract Schedule therefore represents the minimal, most likely duration plan and resources to meet contract time.**
  - **Note that this is not risk-adjusted in that there is no three-point analysis done by repeated iterations using the three duration estimates**
  - **It is a single deterministic schedule produced by choosing the contractor determined and calculated most likely durations for individual activities.**

Definitions

- **The Production Schedule represents the optimistic means and methods which the Prime Contractor intends to employ during project execution to complete early.**
  - **It should represent the commitments made between the Prime Contractor and his subcontractors in the various subcontract agreements.**
  - **In terms of a three-point estimate for activity durations, the Production Schedule would use the "optimistic" duration estimates of individual activities.**
  - **In terms of the logic assignments, the Production Schedule would use all the hard logic constraints, but would minimize the use of preferential logic constraints.**
- **The Production Schedule therefore represents the most aggressive and optimistic plan to complete the project early.**

Benefits

Why use dual project schedules?

Benefits –Contractual Relationships

- **The Contract Schedule represents the commitments that the prime contractor has made to the Owner.**
  - **Overall duration is governed by the prime contract.**
- **The Production Schedule represents the commitments that the prime contractor is requiring of the Subcontractors.**
  - **It is ideal for the subcontractors' contracts have language which ties each Subcontractor's performance period to the performance period shown in the Production Schedule.**
- **One of the primary benefits of using dual project schedules is the ability of the prime contractor to manage performance in all of the contractual relationships that exist on a project.**

Benefits – Early Completion

- **There are occasions when the Contract Schedule may not be able to represent the contractor's actual plan because of stringent requirements in a schedule specification.**
  - **For instance, schedule specifications often limit a contractor's ability to show early completion.**
  - **This creates a problem for contractors who have a contract with excessively long contract duration.**
  - **Long contract durations force a contractor to show unrealistically long activity durations with production rates lower than anticipated, and unless the contractor has the option of showing an early completion schedule, he will be unable to account for any delays or disruptions caused by the Owner or third parties.**

Benefits – Right to Finish Early

- **Production Schedules may help support the contractor's right to finish early position.**
  - **In making such a claim, the use of this schedule could show how his aggressive plan was impacted by the Owner's action or inaction.**
  - **Supported with the appropriate bid information, the use of this schedule might aid in the proof of such a claim.**
  - **The contractor may not be able to get extended general conditions, because it might not show the Critical Path delay in terms of the actual Contract Schedule, but it could help prove disruption that prevented the contractor from finishing as early as possible.**

Benefits - Contingency

- **A contractor might want to use this approach in an informal attempt to create contingency for risks associated with subcontractor performance, particularly in cases where there are unfamiliar or untested subcontractors working on a complicated project.**
- **Analysis of update data for subcontractors will reveal weaknesses in performance, and help direct the project manager's attention to areas that require his assistance.**
- **Owner is likely to see this use as the contractor inappropriately capturing float.**

Benefits – Risk Management

- **Accounting for risks to completion:**
  - **Weather Planning. The Production Schedule may plan for optimistic weather, or, alternately, minimizing performance periods of subcontractors in order to plan for worse weather than shown in Contract Schedule.**
  - **Work Exclusion Periods. Many contracts contain major exclusion periods to accommodate environmental restrictions. These restrictions can magnify the effect of a delay. Finishing work early before the onset of environmental restriction periods, in order to minimize the risk of individual delay events having their effects magnified by the restriction, is a reason why the prime contractor would try to drive subcontractors to meet optimistic duration estimates.**

Benefits – Risk Management

- **Accounting for risks to completion:**
  - **Owner or Third Party Risks. Minimizing the potential impacts of third party risks, or planning for Owner caused risks ("predictable unforseens"). For example, a common unforeseen condition in transportation work is utility conflicts, which, though predictable, are also often unavoidable and have a detrimental effect on contractor production.**
  - **Liquidated Damages. A prime contractor is likely to drive the project towards optimistic performance when liquidated damages are very high, in order to minimize his exposure.**

Costs

What are the risks associated with using dual project schedules?

Cost – Risk in Perception

- **Using a separate, more aggressive schedule can tend to generate confusion in the relationship between the Owner and the Prime Contractor.**
- **Owners will often see the Production Schedule as the "real" plan, and the Contract Schedule as a way to sequester float.**

Cost – Risk in Proof of Delay

- **The primary problem with dual schedule use occurs when the Contractor tries to prove Critical Path delay that exists on the Contract Schedule, which does not exist on the Production Schedule, when the Contractor is actively working means and methods as represented in the Production Schedule.**
  - **When delays are analyzed using the benchmark of the Contract Schedule, delays are much more likely to result in time extensions from the Owner.**
  - **In a litigation situation, there is a risk that the triers-of-fact might decide that the Production Schedules should have been the baseline for analyzing the ramifications of delay, or that the difference is float.**
  - **The Owner will likely feel this way during the project as well, and it promotes the unhealthy attitude of "wait and see" to find out if the predicted delays do in fact create a late condition.**

Cost – Risk to Management

- **Communications get complicated with dual schedules.**
  - **The PM team is always trying to figure out which schedule is under discussion, and even if the subcontractors know about the two schedules, when they are exposed to them on the project, it will cause alarm and a feeling of being constructively accelerated for no reason.**
  - **When a subcontractor is put on notice of lack of production, since that measurement is from the tighter Production Schedule, that subcontractor could take the position that there was more float in the project than admitted in the Production Schedule, justifying more time for performance, and this could result in actual constructive acceleration claims from subcontractors.**

Creation and Maintenance

What is the best way to create and maintain a dual series of schedules?

Creation

- **It is preferable to only have one project schedule that is used for both management and analysis of delays.**
- **However, should the conditions exist which make the use of dual schedules beneficial, there are some general precepts which should be followed.**

Creation – Schedule Shell

- **Steps:**
  - **Create the schedule "shell;" that is, the activity code structure, work breakdown structure, and calendars. This shell will be used for both the Production Schedule and Contract Schedule.**
  - **Create the list of activities. This activity list, developed to the appropriate level of detail (as determined by contract specifications, the needs of project management, etc.), will be used in both the Production Schedule and the Contract Schedule.**
  - **Develop the hard logic. Again, since this is logic representing physical constraints which are inviolable, these logic ties should be common between the two schedules.**
- **At this point, the scheduler should be ready to develop the aspects of the Production Schedule and Contract Schedule which will be different from one another.**

Creation – Production Schedule

- **The first schedule developed should be the Production Schedule.**
  - **This schedule is produced using the optimistic estimate of durations for Prime Contractor activities, and should also take into account subcontractor input for activity durations.**
  - **The Production Schedule differences may be limited to a single trade or discipline; for instance, the Production Schedule may aggressively prosecute the building shell to achieve early dry-in.**
  - **There should be little or no contingency built into the activity durations at this point.**
- **Once this schedule is developed, it can be compared to the contractual project duration to see if it already consumes the contractually allowed time, and if so, it will be necessary to abandon the dual schedule concept.**

Creation – Production Schedule

- **The Production Schedules should be explained to the subcontractors, showing them that it does contain their supplied durations, logic, and dates. The subcontracts should reference this schedule as the only project schedule used for the subcontracts.**

Creation – Contract Schedule

- **The development of the Contract Schedule should involve reassignment of activity durations to allow for the most likely duration estimate, and should add additional preferential logic to show the most likely level of resources.**
  - **The differences between activity durations and preferential logic should be clearly recorded in strong schedule basis documentation that shows the basis of all durations, logic, and resource plans.**
  - **This information will be essential during the progress of the project to understand the dual schedules and their relationship.**

Creation – Schedule Updates

- **Development of the schedule updates can begin with the statusing of either the Contract or the Production Schedule. Progress is only a series of facts about status of activities at a given point.**
  - **There should be no difference between the statuses of the two schedules.**
  - **Since activities and activity IDs are consistent between the two schedules, progress input into one schedule can be easily exported, then imported into the other.**
- **Recalculation as of the common data date will show how the Prime Contractor is matching both the plans.**
- **There may be benefit to recalculating the Contract Schedule on "Progress Override" as an analysis method, in order to review the two schedules' Critical Paths; however, in general, we recommend the use of "Retained Logic" and implementing network revisions to account for any out-of-sequence work.**

Creation – Schedule Updates

- **Schedulers should perform an analysis of both the schedules in order to determine how well subcontractors are performing.**
  - **Review of subcontractor Time Performance Ratio (Actual Duration / Original Duration) will show whether they are meeting the aggressive Production Schedule durations, or even the less optimistic Contract Schedule durations.**
  - **Schedulers should develop comparison layouts to show the two schedules' plans for the next period.**

Creation – Schedule Updates

- **It is advisable to change the logic/durations in the Contract Schedule for the next update period to match those in the Production Schedule.**
- **If the project is progressing well, each update should bring the two schedules closer together as the Contract Schedule is predicting improved completion.**

Risk Management

What techniques should contractors use to minimize these risks?

Risk Management

- **The use of best-case scenario estimates means that a strong qualitative risk management plan is that much more essential.**
  - **Since risk management should be incorporated into the project schedule, any attempt to use dual schedules is likely to reduce the chances of completing on time.**
  - **Risk processes should be applied to the only schedule on the project, used for construction.**
  - **Risk management should also be transparent and reviewed each update, and this process makes at least some of the risk actions hidden.**

Risk Management

- **The Production Schedule does not make any allowance for trade to trade coordination or mobilization and demobilization, and assumes that there is no lost time for additional cleanup or materials delivery or racking.**
  - **This produces a schedule that represents the minimal time frame for construction, and leaves the contractor responsible for a high risk of performance.**
  - **The superintendent will need to use this schedule carefully and motivate the subcontractors and workers to meet the dates and milestones in this schedule.**

Risk Management

- **Once the Production Schedule is developed and checked, the project management team should run a risk management assessment on the project, and identify all risks to performance.**
  - **Weather**
  - **High-risk subcontractors**
  - **Mobilization and Rework Time**

Risk Management

- **The appropriate way to deal with this situation is to tell the Owner up front how the schedule is being developed, and explain the situation.**
- **Attempt to get agreement that any time saved by the production time will be to the contractor's benefit and will not accrue to float for the project, except as the contractual schedule gains time and adds float to the schedule.**

Conclusion

Conclusion

- **It is preferable to only have one project schedule that is used for both management and analysis of delays.**
- **In the rare cases when it is necessary, or when the contractor insists on the use of dual schedules, there are some guidelines that should be followed.**
- **The guidelines primarily revolve around the use of informal risk adjustment to provide some level of protection for a contractor while allowing him to pursue an aggressive schedule that is not highly likely to be achieved.**

MITIGATION OF RISKS IN USING PARALLEL PROJECT SCHEDULES

Questions?

Chris Carson, PSP, PMP, CCM

Corporate Director of Project Controls

ALPHA CONSTRUCTION & ENGINEERING CORPORATION

Chris.Carson@alphacorporation.com

(O) 757-533-9368 (M) 757-342-5524

Patrick M. Kelly, PSP

Project Controls Manager

ALPHA CONSTRUCTION & ENGINEERING CORPORATION

Patrick.Kelly@alphacorporation.com

(O) 757-533-9368 (M) 757-217-6820